Automation and Simulation Research

Statement of Work

Introduction

The disparate and cumulative technology developments in aircraft systems, surface traffic movement, and air traffic management communications all converge on the aircraft crew and interactively influence their behavior. The airspace automation effort is addressing automation concerns in the air and ground operation and control of aircraft with a focus on the future (i.e., 2030 time frame) where vertical lift aircraft accessibility and capability shall enable dramatic increases in airspace capacity.

Scope

The object of the work described here is to pursue human factors research and support of display development for both ground and air operations, and advancement of simulation based evaluation methodologies for component and full system airspace modeling and utilization including vertical lift capabilities. The contractor shall provide the personnel with the requisite expertise to perform the tasks described below.

Tasks

Task 1. Planning and Conduct of Simulation Studies

The contractor shall develop research plans for behavioral experiments based on accepted scientific methods and procedures to enable efficient and safe aviation surface and air operations and airspace management. Specifically, the contractor shall develop and deliver experimental test plans that describe the purpose and hypotheses of the test, relevant background, the independent and dependent variables, constant conditions, number and type of participants required, participant training requirements, equipment required, support personnel required and their roles, the experimental design, instructions to participants, test procedures, data collection requirements, planned summary statistics and inferential statistical analyses, and schedule. The elements of the test plan may be developed separately but shall be aggregated to form a test plan. The plan elements are not required to be edited to form an integrated-text document. The contractor shall develop and deliver training for participants in studies using NASA in-house simulation and simulator facilities. The contractor shall also provide support during the conduct of research in the simulator.

Task 2. Data Reduction, Analyses and Summarization

The contractor shall apply data reduction, summarization, and analyses procedures to data collected during part-task and full-mission simulations. Data reduction and summarization shall be applied to automatically collected data as well as subjective measurement results, and video and audio records, as necessary. The results of the data summarization shall be delivered to the Government.

Task 3. Surface and Airspace Operations Scenario Development

The contractor shall review and develop understanding of surface and airspace operations concepts including proposed technology, procedures, and operations. The contractor

shall participate in scenario development for real and fast-time simulations, specifically for surface and airspace operations concepts. The contractor shall review scenarios developed for surface and airspace operation simulations by the Government.

Task 4. Off-Nominal Testing Methodologies
The contractor shall develop methodologies for assessing off-nominal events, and incorporating off-nominal events into experimental designs for real-time simulations. The goal of this work is to develop a better understanding of conditions and circumstances that lead to human error in the aviation context, and the ability to more effectively mitigate these conditions leading to error, i.e., off-nominal settings.

Task 5. Publications and Presentations Preparation
The contractor shall develop reports in government publication, proceedings or journal publication format, as appropriate, for completed airspace automation research activities. Presentation materials to support delivery of oral presentations at scientific meetings shall also be prepared as necessary. The efforts of the contractor shall include writing, editing and development of illustrations for the reports and presentations.

Task 6. Meeting and Review Participation
The contractor shall participate in airspace automation research meetings and project reviews at NASA Ames Research Center, Moffett Field, California. The contractor also shall attend, present findings, and support other meetings as required, including briefings for the Federal Aviation Administration and other airspace stakeholders.

Deliverables Summary

- Task 1: A Draft Test Plan Report shall be prepared as described above for the aggregated experimental effort documenting procedures, protocols, schedules, data collection, data reduction, and analysis and evaluation procedures to be employed in the research activities. The Draft Test shall be submitted to the Government within 3 months of task initiation. A Final Test Plan shall be submitted to the Government for approval within 4 months of task initiation.
- Task 2: The Data Summarization Report shall be submitted to the Government within 8 months of task initiation.
- Task 3: The Surface and Airspace Operation Report documenting the operational concepts and simulations developed shall be provided to the Government within 9 months of task initiation.
- Task 4. The Off-Nominal Assessment Report of assessing the challenges of human error likelihood and mitigation strategies shall be provided to the Government within 12 months of task initiation.

• Task 5. The contractor shall provide graphics, manuscripts, reports and papers as specified above by the Government in quarterly submittals (every three months) for review and approval. The documentation shall be in electronic format for reproduction.

• Task 6. The contractor shall provide a summary written report providing subject matter expert assessment and evaluation of the meetings attended within 7 days of the completion of that meeting. These reports shall clearly review the objectives, scope, and findings of the meetings from the subject matter expert's perspective. As appropriate, recommendations for future actions shall be included.

Travel

Three trips of five days duration for one person are anticipated to present research findings to the Government at NASA Ames Research Center.

Period of Performance

All work is to be completed within 12 months of task initiation.

Place of Performance

The work will be performed at the contractor's facilities and on-site at NASA Ames Research Center.